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# INVENTORY AND USE OF WET SOILS AREAS IN THE WISCONSIN PORTION OF THE SOUTHEAST WISCONSIN RIVERS BASIN

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WORKING MATERIALS FOR

## SOUTHEAST WISCONSIN RIVERS BASIN

UNITED STATES DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE  
ECONOMIC RESEARCH SERVICE  
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INVENTORY AND USE OF WET SOILS AREAS  
IN THE WISCONSIN PORTION OF THE  
SOUTHEAST WISCONSIN RIVERS BASIN

by

GALE E. EWALD, Economist, and  
LAVERNE C. STRICKER, Biologist, SCS

REFERENCE REPORT NO. 4

SOUTHEAST WISCONSIN RIVERS BASIN

UNITED STATES DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE  
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SUMMARY

A survey was conducted in 1969 to determine the land use on wet soils (somewhat poorly and poorly drained mineral and organic soils) in the Southeast Wisconsin Rivers Basin. Data was collected for individual watersheds from Soil Conservation Service District Conservationists in 41 Wisconsin counties. The survey information was used to supplement the inventory of economic data for the river basin study. In addition, there was a need to determine the economic feasibility of installing future PL-566 watershed works of improvement in watersheds selected for study.

According to the survey, 28 percent of the total wet soils in the Wisconsin portion of the basin is utilized for cropland. Other land uses as a percent of the total wet soils area were: permanent pasture and hayland - 13 percent; ~~woodland~~ <sup>forestland</sup> - 33 percent; wildlife - 16 percent; and, other - ten percent.

Survey respondents were requested to classify wet soil land uses by primary uses only; therefore, the total land reportedly utilized for all wildlife purposes is somewhat low. A considerable amount of permanent pasture, hayland and woodland harbor wildlife and can also be classed as wildlife land to some extent. To more accurately determine the actual acreage used for wildlife purposes in the Wisconsin portion of the Basin, the Wisconsin Department of Natural Resources and other agencies were consulted. Based on information from these sources, it is estimated that



INVENTORY AND USE OF WET SOILS AREAS  
IN THE WISCONSIN PORTION OF THE  
SOUTHEAST WISCONSIN RIVERS BASIN

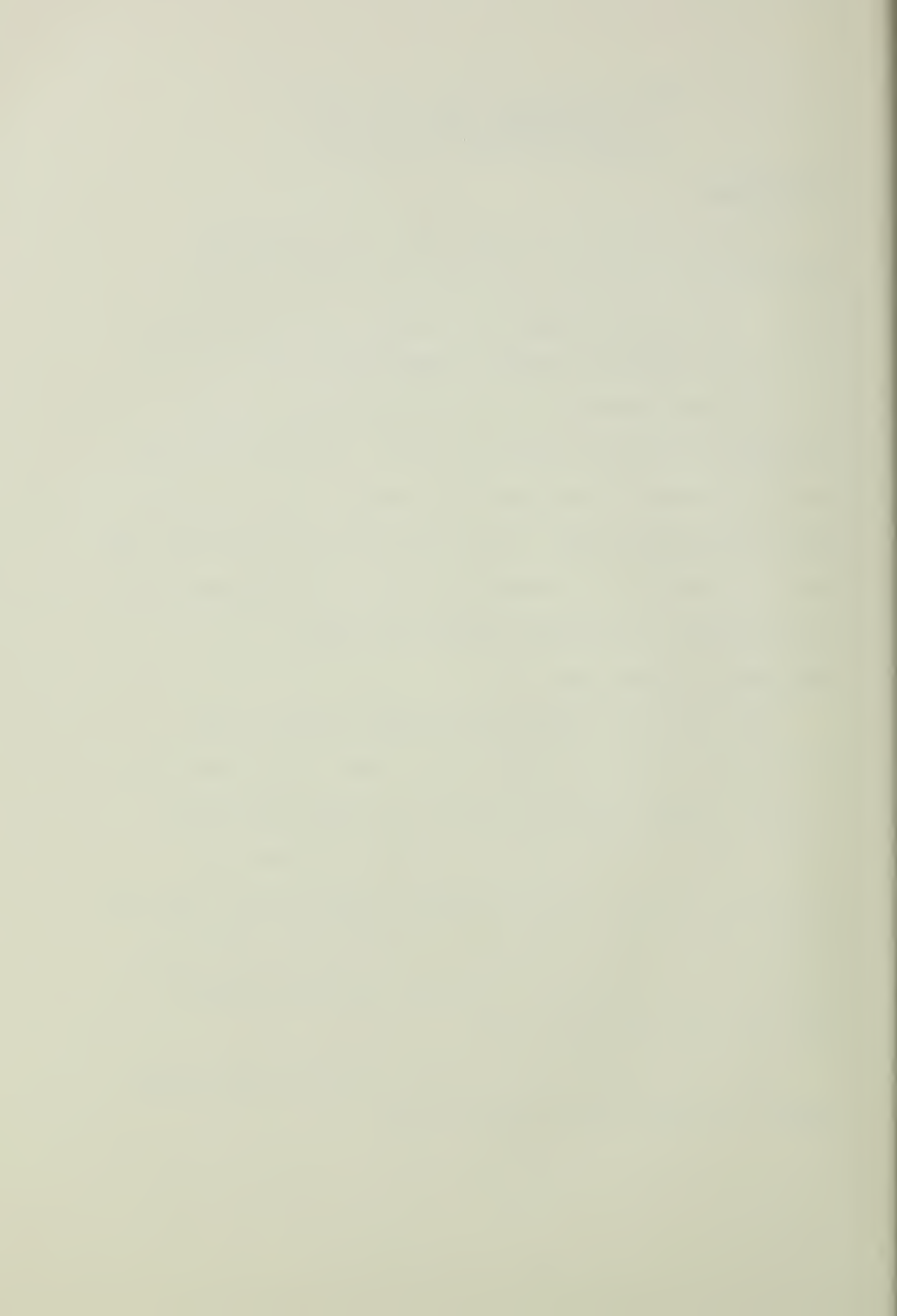
Introduction

In 1969 a survey to determine land use in individual watersheds was conducted in the Southeast Wisconsin Rivers Basin. (See Figure 1, page 17.) The land use data requested was for land subject to wetness. Questionnaires were sent to District Conservationists in 41 Wisconsin counties located completely or partially within the basin. Information from the survey was needed to supplement the inventory of economic data for the River Basin Study. It will also be used to determine the economic feasibility of installing future PL-566 watershed works of improvement in watersheds selected for study.

Description of Study Area

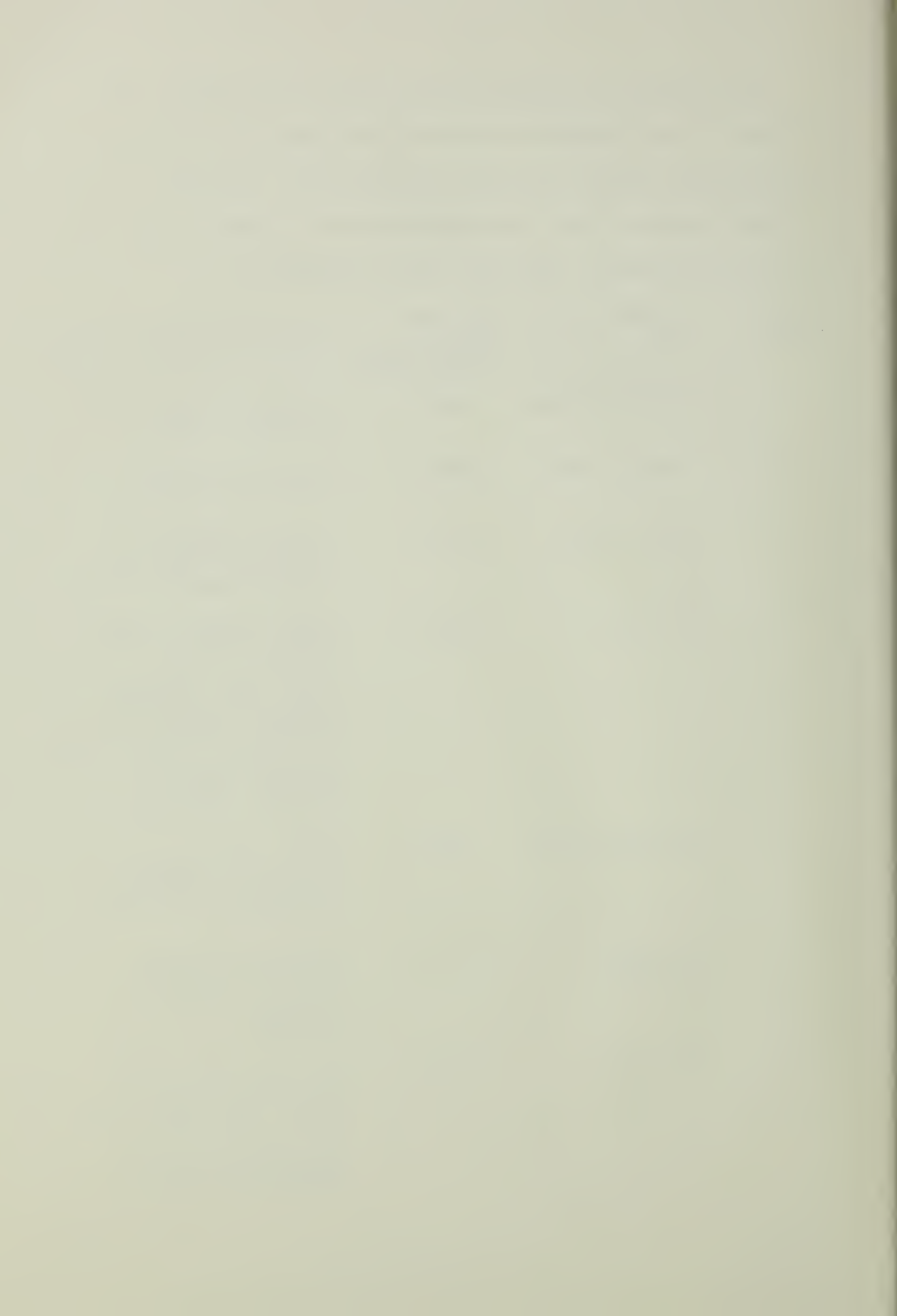
The study area included the Wisconsin portion of the Southeast Wisconsin Rivers Basin only. There are portions of two major drainage basins in the area, the Upper Mississippi and the Great Lakes-St. Lawrence. Included in these major drainage basin areas are eight subbasin drainage areas: Menominee River, Peshtigo River, Oconto River, Wolf-Fox River, Milwaukee River, Fox River (Illinois), Rock River, and other drainage areas less than 800 square miles.

Major sized cities within the basin are Green Bay, Kenosha, Madison, Milwaukee, Racine and West Allis.



The study area is bounded on the east by Lake Michigan, on the west by the Wisconsin-Galena-Platte drainage basins, and on the north and south by the Wisconsin state line. Wisconsin counties included within the eight subbasins are shown in the following tabulation. Also, see Figure 2, page 18.

Subbasin Number	Subbasin Name	Wisconsin Area in Square Miles	Wisconsin Counties Included
1	Menominee River	1,546.5	Florence, Forest, Marinette, Vilas
2	Peshtigo River	1,090.0	Florence, Forest, Marinette, Oconto
3	Oconto River	1,045.1	Forest, Langlade, Marinette, Menominee, Oconto, Shawano
4	Wolf-Fox	6,385.1	Adams, Brown, Calumet, Columbia, Dodge, Fond du Lac, Forest, Green Lake, Langlade, Marathon, Marquette, Menominee, Oconto, Oneida, Outagamie, Portage, Shawano, Waupaca, Waushara, Winnebago
5	Milwaukee River	899.9	Dodge, Fond du Lac, Milwaukee, Ozaukee, Sheboygan, Washington, Waukesha
6	Fox River (Illinois)	1,077.3	Jefferson, Kenosha, Milwaukee, Racine, Walworth, Washington, Waukesha
7	Rock River	5,566.2	Columbia, Dane, Dodge, Fond du Lac, Grant, Green, Green Lake, Iowa, Jefferson, Lafayette, Rock, Walworth, Washington, Waukesha



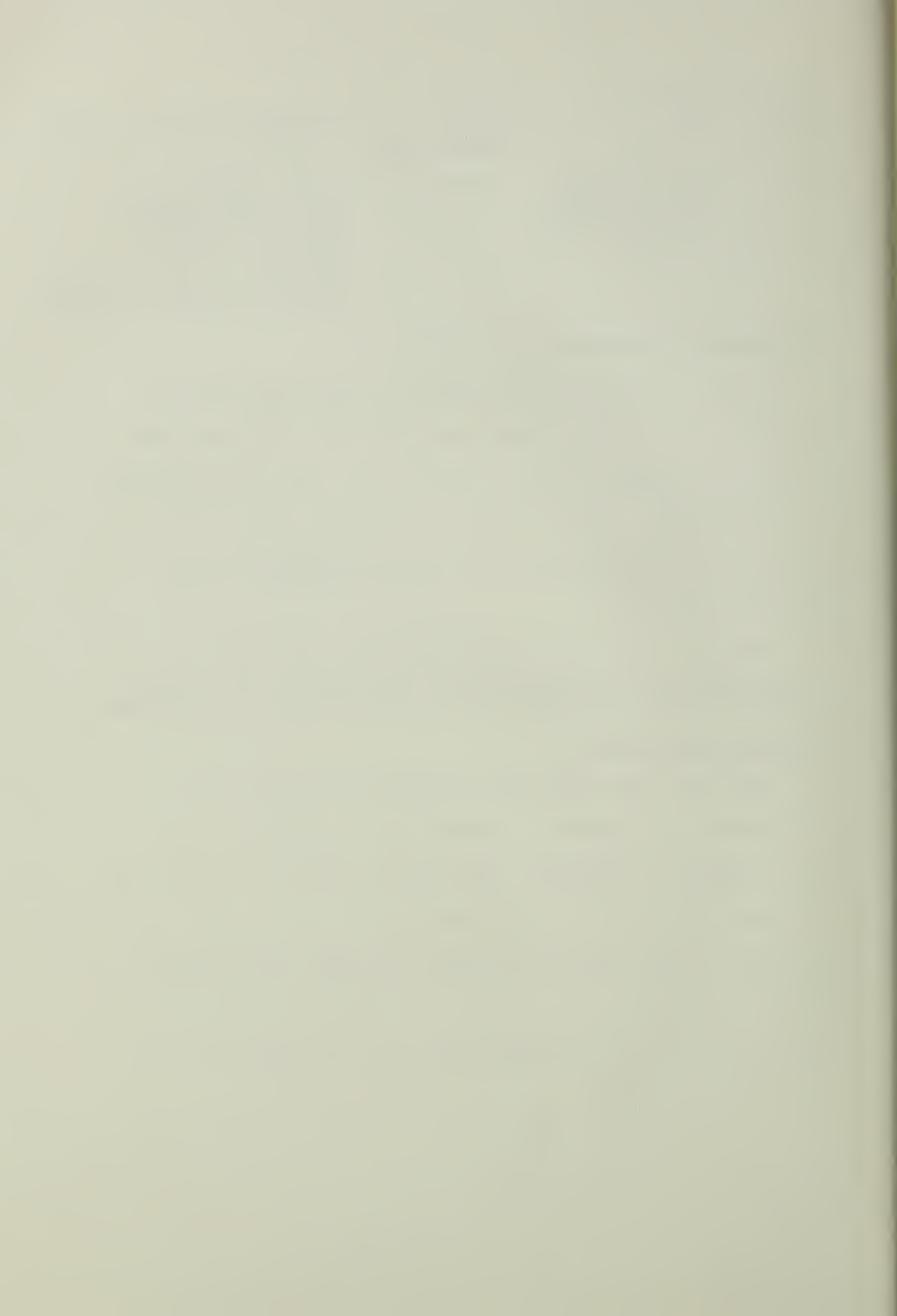
Subbasin Number	Subbasin Name	Wisconsin Area in Square Miles	Wisconsin Counties Included
8	Minor Drainage Areas Less Than 800 Square Miles	3,226.0	Brown, Calumet, Door, Fond du Lac, Kenosha, Kewaunee, Manitowoc, Milwaukee, Oconto, Outagamie, Ozaukee, Racine, Shawano, Sheboygan, Waukesha

#### Description of Questionnaire

A copy of the survey questionnaire is shown in Figure 3, page 19. Items 1 and 2, total watershed (acres) and wet soils (acres) were completed prior to mailing the forms to the District Conservationists. As the acreage was recorded, appropriate watershed code designations were entered horizontally along the top of the forms.

Watershed acres were obtained from Reference Report No. 10, Areal Measurement and Nomenclature of Watersheds in the Southeast Wisconsin Rivers Basin.

Wet soils areas were first determined for 30 selected watersheds to determine the feasibility of installing future PL-566 works of improvement. Wet soils in these watersheds were delineated and measured on Soil Conservation Service soils maps. Wet soils in the remaining Wisconsin watersheds were estimated by the Southeast Wisconsin Rivers Basin staff utilizing available soils maps, U.S.G.S. quadrangle maps, and projections from the 30 selected watersheds.





Questionnaire Items 4 through 10 asked for the percent of land in each of the various land use categories in the wet soils areas. (See Figure 3, Questionnaire Item 3.) The land uses were: cropland, pasture and hayland, woodland, wildlife, recreation, urban, and other. A letter of instructions that accompanied the survey forms defined the land use categories as follows:

Cropland - All row crops, small grains, truck crops, and rotation hay and pasture.

Pasture and Hayland - Permanent pasture and hayland only.

Not included is rotation hay and pasture which is considered to be cropland. Woodland pasture is also included in this category if its primary use is for pasture.

~~Forestland~~ <sup>Forested</sup>  
Woodland - Wooded areas producing or capable of producing marketable timber. Acreages listed under other land uses are not included.

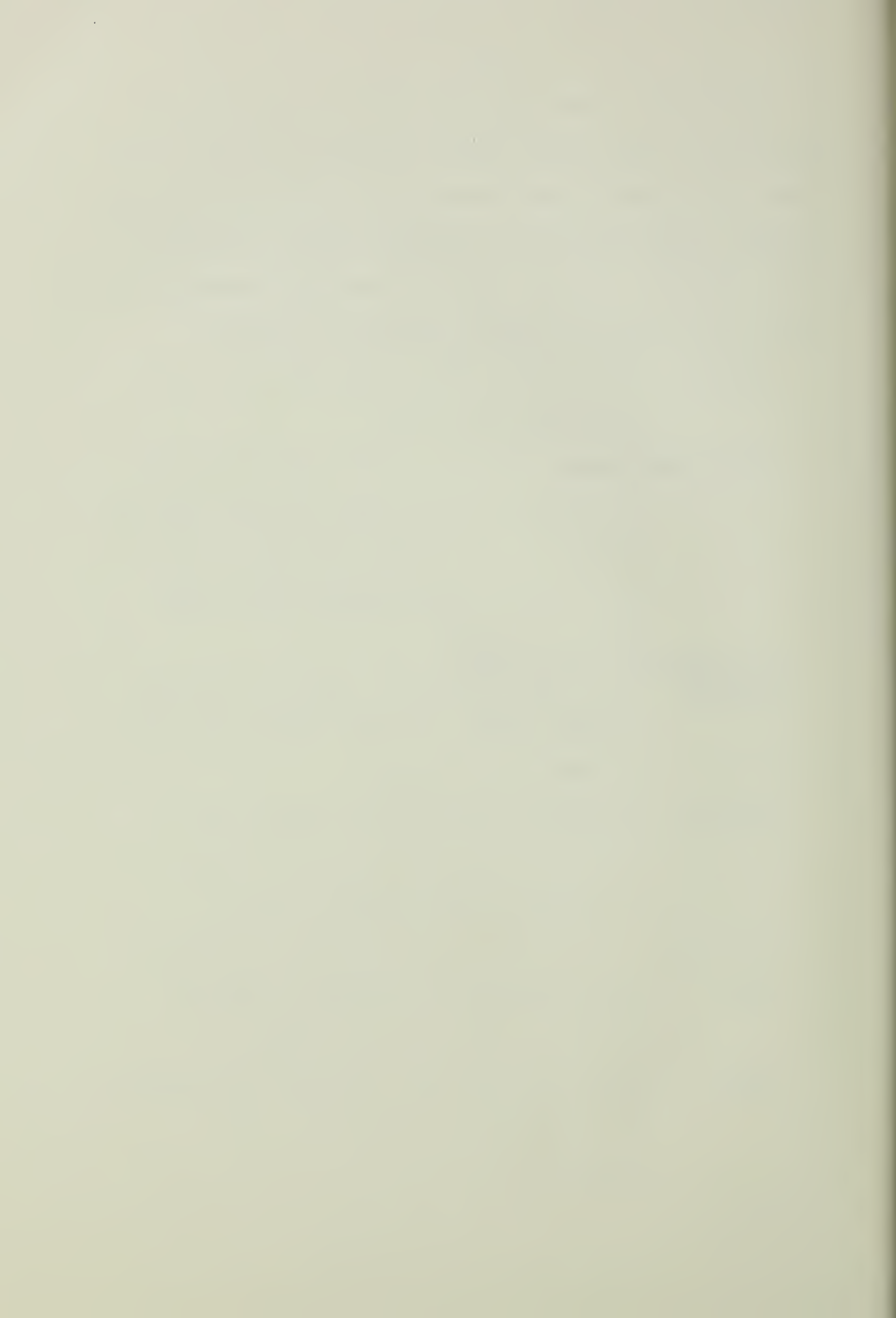
Wildlife - Areas which provide wildlife habitat only.

Drainage and clearing is usually necessary if conversion to agriculture is desired.

Recreation - Includes both private and public recreation.

Urban - Includes dwellings and business or industry facilities in all cities and villages.

Other - Roads, farmsteads, etc. (Includes miscellaneous areas not covered in Questionnaire Items 4 through 9)



The sum of all land use percentages equaled 100.

#### Survey Tabulation

All wet soils acreage figures on the Questionnaire (Item 2) were multiplied by their respective land use percentages (Items 4 through 20) to arrive at numbers of acres in each land use. A tabulation of this data was first made for each of 30 selected basin watersheds. Land use data is essential as a basis for estimating economic damages with and without proposed project measures installed.

The computed acreage data was then tabulated for the remaining watersheds and the eight hydrologic subbasins in the Southeast Wisconsin Rivers Basin. This tabulation was accomplished through the use of a computer; whereas, the first tabulation for the 30 watersheds was done manually. Input to the computer consisted of individual watershed wet soil acreage data and land use percentages. Wet soils acreages by land use were then computed and printed out as subbasin totals.

A tabulation of the survey data for the eight subbasins is shown in the Wet Soils Survey Table on page 6.



## SOUTHEAST WISCONSIN RIVERS BASIN

(Significance not implied beyond three digits.)

		S U B B A S I N S								
Item	Unit	1	2	3	4	5	6	7	8	Total
Total Wet Soils Area	Acres	200,790	181,899	146,542	808,054	90,945	188,508	617,649	319,051	2,553,438
Cropland Permanent	Acres	4,281	11,200	8,316	181,471	29,888	104,028	257,735	122,798	719,717
Pasture and Hayland	Acres	7,096	10,752	8,260	96,624	14,687	18,482	116,740	45,218	317,859
Woodland	Acres	162,345	128,359	105,158	287,461	14,093	13,626	50,261	79,688	840,991
Wildlife	Acres	15,993	20,569	12,068	175,410	14,748	19,896	117,871	32,501	409,056
Other	Acres	11,075	11,019	12,739	67,088	17,529	32,475	75,042	38,845	265,812
Cropland Permanent	Percent	2.1	6.2	5.7	22.5	32.9	55.2	41.7	38.5	28.2
Pasture and Hayland	Percent	3.5	5.9	5.6	11.9	16.1	9.8	18.9	14.1	12.5
Woodland	Percent	80.8	70.6	71.8	35.6	15.5	7.2	8.1	25.0	32.9
Wildlife	Percent	7.9	11.3	8.2	21.7	16.2	10.6	19.1	10.2	16.0
Other	Percent	5.5	6.0	8.7	8.3	19.3	17.2	12.1	12.2	10.4
Distribution of Cropland										
Corn	Acres	235	3,158	1,597	52,264	9,325	49,726	153,095	33,524	302,924
Oats	Acres	355	2,453	2,212	30,850	6,994	12,275	29,382	28,612	113,133
Other Small Grain	Acres	0	45	58	4,174	1,943	6,970	5,412	4,789	23,391
Hay and Pasture in Rotation	Acres	3,691	5,242	4,266	80,210	9,415	23,406	37,372	45,803	209,405
Sweet Corn	Acres	0	168	75	4,900	1,165	1,248	15,979	3,070	26,605
Canning Peas	Acres	0	134	75	2,359	687	520	7,732	2,579	14,086
Other	Acres	0	0	33	6,714	359	9,883	8,763	4,421	30,173
Corn	Percent	5.5	28.2	19.2	28.8	31.2	47.8	59.4	27.3	42.1
Oats	Percent	8.3	21.9	26.6	17.0	23.4	11.8	11.4	23.3	15.7
Other Small Grain	Percent	0	.4	.7	2.3	6.5	6.7	2.1	3.9	3.2
Hay and Pasture in Rotation	Percent	86.2	46.8	51.3	44.2	31.5	22.5	14.5	37.3	29.1
Sweet Corn	Percent	0	1.5	.9	2.7	3.9	1.2	6.2	2.5	3.7
Canning Peas	Percent	0	1.2	.9	1.3	2.3	.5	3.0	2.1	2.0
Other Crops	Percent	0	0	.4	3.7	1.2	9.5	3.4	3.6	4.2

\* Wisconsin portion of Southeast Wisconsin Rivers Basin only



# Wet Soils Areas

The following table shows a comparison of wet soils acres with total acres by subbasin in the Wisconsin portion of the Southeast Wisconsin Rivers Basin.

## TOTAL ACRES AND WET SOILS ACRES IN THE WISCONSIN PORTION OF THE SOUTHEAST WISCONSIN RIVERS BASIN

Subbasin	Wet Soils Area (acres)	Total Area (acres)	Percent Wet Soils Area
1	200,790	989,736	20.3
2	181,899	697,628	26.1
3	146,542	668,889	21.9
4	808,054	3,954,052 <sup>1/</sup>	20.4
5	90,945	575,915	15.8
6	188,508	689,402	27.5
7	617,649	3,562,392	17.3
8	319,051	2,064,626	15.4
Total	2,553,438	13,202,640	19.3

<sup>1/</sup> Does not include 132,400 acres in Lake Winnebago

Nearly one-fifth of the land area in the Wisconsin portion of the Southeast Wisconsin Rivers Basin is wet. By individual subbasins, wet soils acres as a percent of total acres varied from a low of 15 percent in Subbasin 8 to a high of 28 percent in Subbasin 6. The varying proportions of wet soils acres to





total acres in the eight Wisconsin subbasins are due in part to the effects of glaciation. Soil texture is another factor. For example, in subbasin 8, much of the poor drainage is due to the slow permeability of the soils. On the other hand, moraine relief and low depressional areas are primarily responsible for the relatively high proportion of wet soils in subbasin 7.

#### Cropland and Woodland

Cropland as a percent of total wet soils acres in the Wisconsin portion of the river basin, ranges from a low of two percent in subbasin 1 (Menominee) to a high of 55 percent in subbasin 6 (Fox River). Other subbasins having at least 32 percent of total wet soils acres in cropland are subbasins 5, 7 and 8. The average for the entire basin is 28 percent.

Weather is the major factor that determines the general pattern and intensity of cropping in the eight Wisconsin subbasins, although conditions and cultural practices also play a part. The length of growing season is that period between the last killing frost in the spring and the first freeze in the fall. (See Figure 4, page 20.) The growing season ranges from less than 120 days in the extreme north to more than 160 days in the southeastern portion of the basin.

As might be expected, all of the subbasins with a large proportion of cropland possess highly productive soils and adequate growing seasons and rank well above the state's average in the value of agricultural sales per farm. Although dairy



products are the most important single source of farm income, there has been a strong trend toward cash cropping in recent years. Generally, these subbasins are lightly forested. Their reputation as good farming areas was established early. The prairie land was easy to clear and cultivate. Wheat was a common crop until the late 1800's when dairying became important.

Of the total wet soils acres in northern Wisconsin, cropland accounts for only two percent in subbasin 1; six percent in subbasin 2; and six percent in subbasin 3. Woodland is proportionately higher in these areas (71 to 81 percent).

Subbasin 4, with 22 percent cropland and 36 percent woodland, is between the intensively cropped, sparsely wooded subbasins, and the less intensively cropped but heavily wooded subbasins.

In subbasins 5, 6, 7 and 8, where cropland accounts for the largest single land use category, woodland ranges from only seven percent to 25 percent of the total wet soils area.

The northern portion of subbasin 4, which includes Forest, Oneida, Langlade, Menominee, and Shawano Counties, is moderately to heavily wooded with little cropland. Progressing southward in subbasin 4, the growing season is longer. Crop production is more important with more land utilized for production. In Winnebago, Fond du Lac, Green Lake and Outagamie Counties, for example, a high proportion of the wet soils acres is devoted to cropland while woodland acreage is minor.



### Permanent Pasture and Hayland

Land in this category, as a percent of total wet soils area, ranges from a low of four percent in Subbasin 1 to a high of 19 percent in subbasin 7. Other subbasins showing over ten percent of wet soils area devoted to permanent pasture and hayland are subbasins 4, 5 and 8. These areas include the more important dairy and livestock producing areas in Wisconsin. Subbasin 6 (Waukesha, Walworth, Racine and Kenosha Counties) has only ten percent pasture and hayland. For the entire basin, permanent pasture and hayland accounts for 12 percent of the total wet soils area. In recent years, dairying and the raising of livestock in subbasin 6 has declined at a greater rate than in most of the basin due to a greater emphasis on the production of specialty crops and the transition of agricultural land to urban purposes.

### Other Land

Questionnaire Items 8, 9 and 10, Recreation, Urban and Other, were combined and tabulated as Other. There was some confusion on the part of the respondents regarding the proper listing of Urban and Recreation. Some entered urban parkland acreage under urban acreage, while others listed this item as "Recreation". To facilitate the survey tabulation, it was decided to combine the three items into one category.

Other land as a percent of total wet soils acres averaged from six percent to eight percent in Subbasins 1 through 4, and from 12 percent to 19 percent in subbasins 5 through 8. The



average for the entire basin was ten percent. Higher percentages in the southern subbasins reflect a higher degree of urbanization in these areas.

#### Fish and Wildlife

According to the survey, wet soils utilized as primary wildlife habitat accounted for a low of eight percent and a high of 22 percent respectively of the total wet soils areas in subbasins 1 and 4. Sixteen percent of the wet soils in the entire basin is used primarily for wildlife habitat. These survey percentages are somewhat low because the survey respondents were asked to report wildlife land as acreage used exclusively for wildlife purposes. A considerable amount of permanent pasture, hayland and woodland harbor wildlife and can also be classed as wildlife land. This habitat was not included in the survey.

To more accurately determine the actual acreage utilized for wildlife purposes in the Wisconsin portion of the basin, the Wisconsin Department of Natural Resources and other agencies were consulted. Information from these sources formed the basis for the wildlife land discussion.

#### Wetland Wildlife Habitat

The most important wildlife habitat in the basin occurs in wetland areas. Wetlands as used in this report refers to lowland covered with shallow and sometimes temporary or intermittent waters.





Of the 20 wetland types in the United States, eight occur in the Southeast Wisconsin Rivers Basin. They are as follows:

1. Seasonally flooded agricultural land
2. Fresh meadow or sedge meadow
3. Shallow fresh water marsh - up to six inches of water
4. Deep fresh marsh - up to three feet of water
5. Open fresh water - up to ten feet of water
6. Shrub swamp
7. Wooded swamp
8. Bogs

Originally wetlands made up a high percentage of the land in the basin. Conversion to agriculture and other uses has reduced wetland acreage considerably. Wetland areas remaining are often small areas less than 50 acres in size with great value for wildlife. Wetlands occur in somewhat poorly and poorly drained mineral soils and in organic soils. Most of the mineral soils have been drained and the remaining wetlands are predominantly organic.

Wetland types 1 through 5 are considered most valuable for wildlife generally. The figures in the following table are broken down into acres in wetland types 1 through 5 and acres in wetland types 6 through 8 by subbasins.



Subbasin	1-5	6-8 (Acres)	Total	Wetlands Under Management <sup>1/</sup>
1	1,500	36,000	37,500	460
2	1,000	25,000	26,000	320
3	3,000	12,000	15,000	5,700
4	175,500	48,200	223,700	86,740
5	28,000	17,500	45,500	9,200
6	36,300	4,700	41,000	5,450
7	191,000	41,100	232,100	76,770
8	33,200	23,100	56,300	28,250
	<hr/> 469,500	<hr/> 207,600	<hr/> 677,100	<hr/> 212,890

These are estimates. Acreages are larger than those shown under Wildlife in the Wet Soils Survey Table (page 6) because:

1. Wetlands in Types 1, 2 and 3 may be used as pasture and some of this acreage is placed in the pasture category on the Wet Soils Survey Chart.
2. Wetlands in Types 6 through 8 may be classified also as woodland. Some of this acreage is placed in the woods category on the Wet Soils Survey Chart.

<sup>1/</sup> Wetlands Under Management are those in which some form of management, e.g., ponds, level ditching, flooding, or merely fencing, has occurred. Approximately one-third of the wetland acres in the basin has had some form of management. These figures are from Soil Conservation Service records.



Other Wildlife Habitat

The remaining important wildlife habitat in the wet soils areas occurs in unpastured wooded areas, diverted cropland and lakes and streams. This is in addition to the wetland areas already mentioned. About 84,000 acres of the unpastured woodland is in the wet soils area. This woodland is in somewhat poorly drained class of soils. The wooded swamp and bog already mentioned are in poorly drained mineral soils and organic soils.

Acreage diverted from agricultural use under government programs varies from year to year. In 1968, 465,717 acres were diverted in the counties within the basin. It is estimated that 90,000 of these diverted acres are found in the wet soils area.

Another important part of the fish and wildlife habitat is lakes and streams. Approximately 4,800 lakes totaling 450,000 acres, and 8,500 miles of streams totaling 32,000 acres are in the basin.

Total Fish and Wildlife Habitat in the  
Southeast Wisconsin Rivers Basin  
Wet Soils Area and Lakes and Streams

<u>Type</u>	<u>Description</u>	<u>Acres</u>
Wetland	Type 1-5	469,500
	Type 6-8	207,600
Land Retirement	Feed Grain	90,000
Woodland (Not Included in Type 6-8)		84,000
Lakes	4,800	450,000
Streams	8,500 miles	32,000



### Distribution of Crops

Corn is the most important crop grown on the wet soils areas in the Southeast Wisconsin Rivers Basin. According to the survey, corn for grain and silage accounted for 42 percent of the wet soils cropland in the basin. By subbasins, corn acreages on wet soils as percents of total cropland subject to wetness ranged from a low of six percent in subbasin 1 to a high of 59 percent in subbasin 7. The southern third of the basin is traditionally known as "Corn Country". Dane, Rock and Dodge Counties in subbasin 7 lead all other Wisconsin counties in corn production.

Oats were grown on 16 percent of the wet soils cropped in the basin. This crop was grown on less than 12 percent of the wet soils cropland in subbasins 1, 6 and 7, and from 17 percent to 27 percent in the remaining subbasins. The general trend in oat acreage has been downward since about 1955.

Other small grains accounted for only three percent of the wet soils cropland in the basin. Included in this category were spring wheat, winter wheat, rye and barley. The survey indicated that six percent and seven percent respectively of the wet soils in subbasins 5 and 6 were utilized for small grains. These crops accounted for less than four percent of cropland in the remaining six subbasins. Other small grains have also been declining in importance for several years.





Hay and pasture acres in rotation accounted for 29 percent of the wet soils cropland in the basin. Land utilized for these crops, as a percent of all cropland subject to wetness, ranged from a high of 86 percent in subbasin 1 to a low of 14 percent in subbasin 7. As might be expected, the number of hay and pasture acres in rotation had a general inverse relationship to the number of corn acres in the entire basin. Only subbasins 6 and 7 had more wet cropland devoted to corn than to hay and pasture acres in rotation.

Sweet corn and canning peas were grown on wet soils in all subbasins except subbasin 1, accounting for six percent of the total wet soils area cropped. These crops were the most significant in subbasins 4, 5, 7 and 8 where they accounted for four percent, six percent, nine percent, and five percent respectively of the cropland subject to wetness. The leading sweet corn and canning pea producing counties in Wisconsin are: Columbia, Dane, Dodge and Fond du Lac. All of these counties are in subbasins 4 and 7.

The other principal crops reported as grown on wet soils acres were: soybeans, snapbeans, sod, carrots, beets, and peppermint. In subbasin 6, ten percent of the wet soils cropland was utilized for these crops. Sod, carrots, beets, and peppermint are of particular importance in Jefferson, Rock, Waukesha, Walworth, Racine and Kenosha Counties.



-17-

## SOUTHEAST WISCONSIN RIVERS BASIN



FIGURE 1



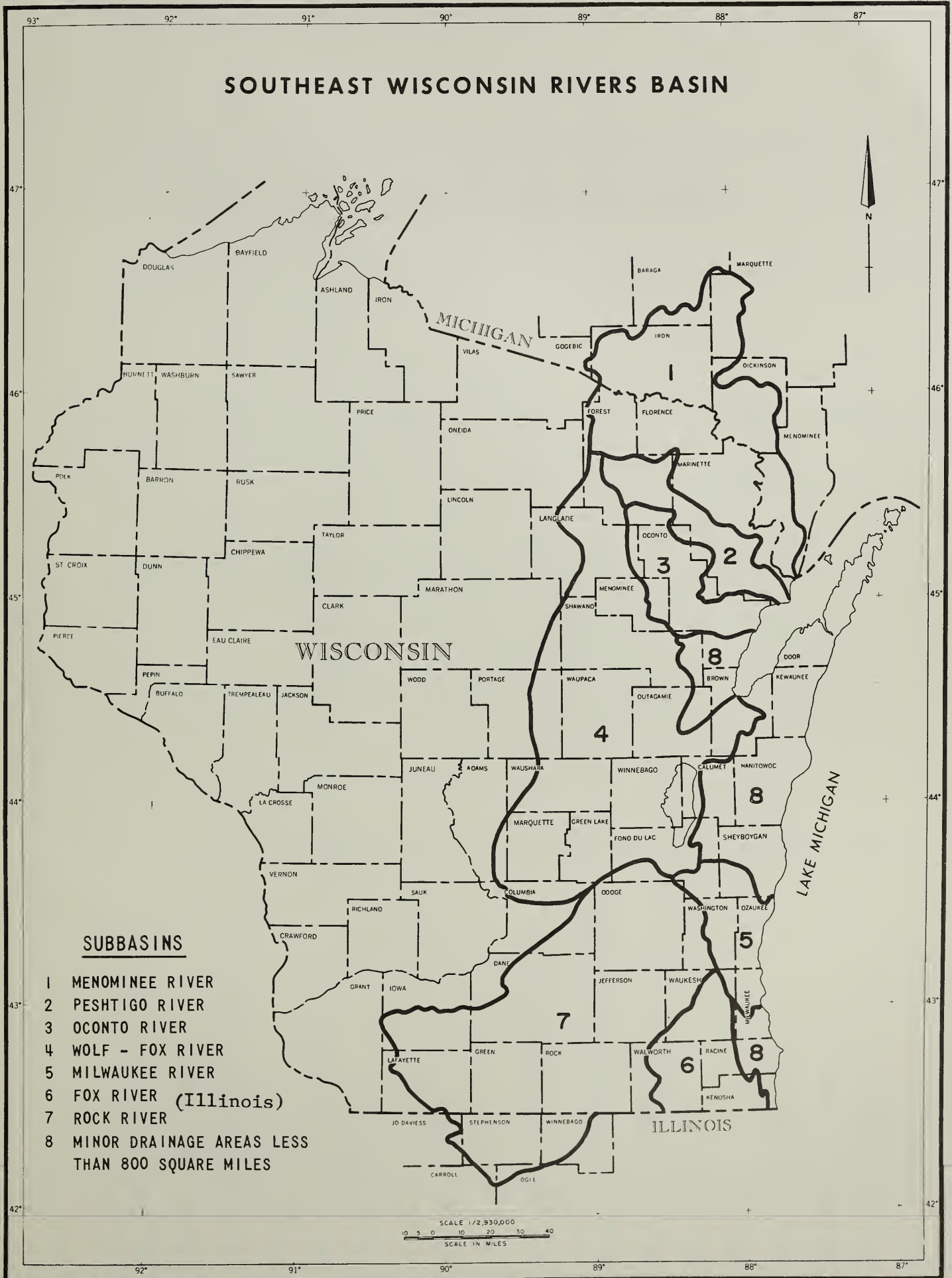


FIGURE 2





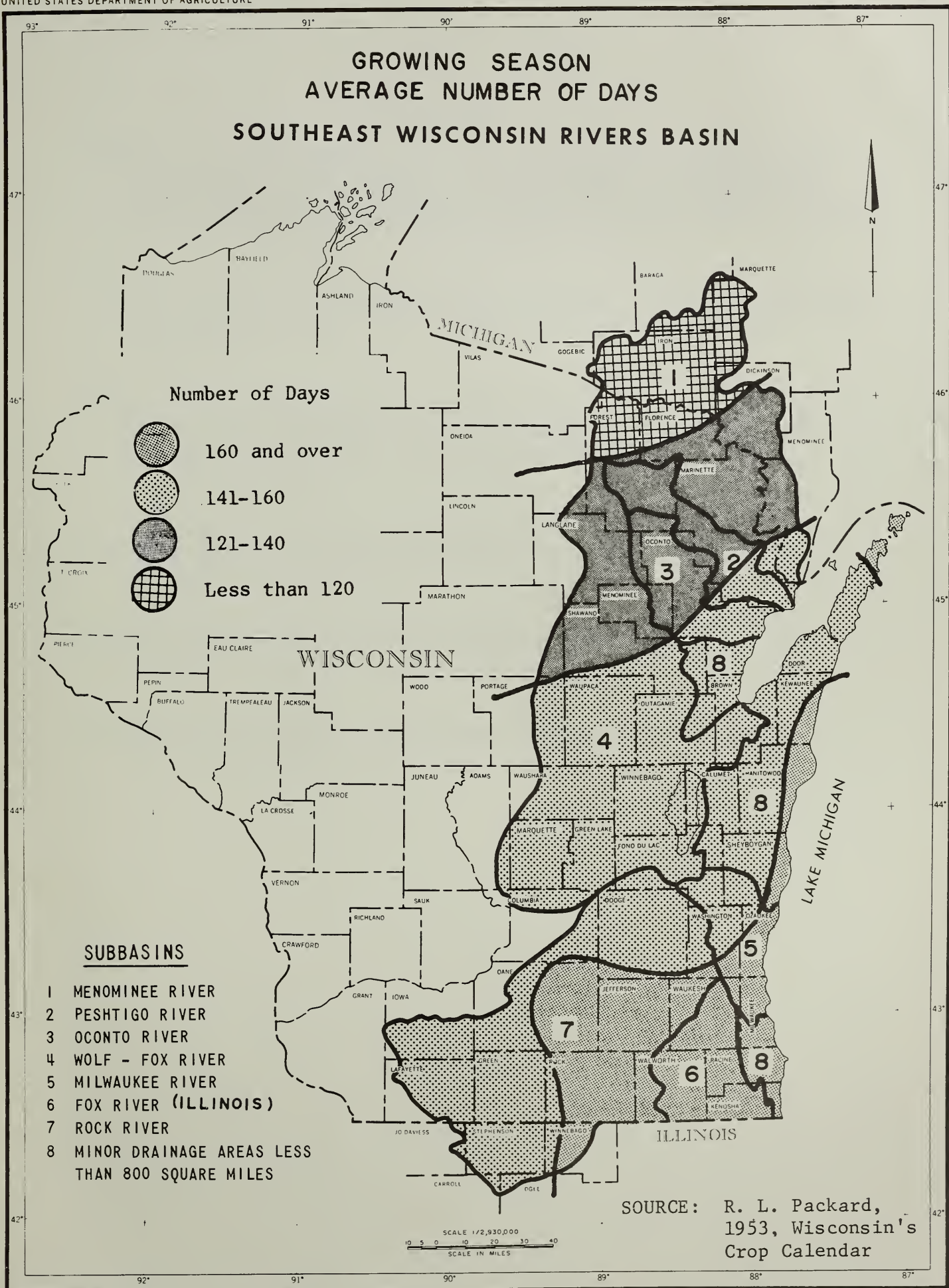
FIGURE 3

WET SOILS WORK SHEET

	WATERSHEDS									
1. Total Watershed (acres)										
2. Wet Soils (acres)										
3. Land Use in Wet Soils Areas										
4. Cropland (%)										
5. Pasture and Hayland (%)										
6. Woodland (%)										
7. Wildlife (%)										
8. Recreation (%)										
9. Urban (%)										
10. Other (Roads-farmstead) (%)										
List below the percent distribution of cropland shown in item 4 above.										
11. % Distribution of Crops										
12. Corn										
13. Oats										
14. Other Small Grain										
15. Hay and Pasture										
16. Sweet Corn										
17. Canning Peas										
18. Other (Specify)										





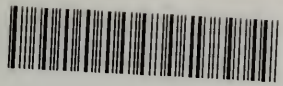




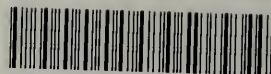
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